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Acupuncture and Its Role in Modern Medicine

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Although both the philosophic and physiologic basis of acupuncture seems fanciful to Western medical thinking, the results obtained in the treatment of certain disease states cannot be lightly dismissed. Its use in the induction of surgical analgesia may have immediate application for Western Medicine.

Its mechanism of action is a complete enigma, but information accumulated from research in hypnosis, visceral learning and, most important, the physiology of pain perception may contain clues to the pathophysiologic principles involved.

The fact that many disorders for which acupuncture therapy is useful are thought to have a large psychosomatic component only serves to reinforce the Eastern concept of inseparability of mind and body. A great deal of attention is being given to this concept in the current medical literature.

In order to define the role of acupuncture in modern medical practice, a more scientific approach in both clinical and basic research is necessary. If acupuncture can be proved safe and efficacious in the treatment of certain diseases, lack of knowledge regarding its mechanism of action should not delay its incorporation into our medical armamentarium.

ACUPUNCTURE IS ONE of the world's oldest healing arts. It encompasses an empiric body of knowledge accumulated over the past five thousand years. So little scientific information has appeared in the literature that an accurate appraisal of the therapeutic value of acupuncture is difficult. Moreover, ancient and modern approaches to acupuncture, although very different, are often confused, making interpretation of results impossible.

The ancient Chinese concept of disease and its schema for acupuncture therapy were thoroughly covered in a recent review,[1] therefore this paper will concentrate on acupuncture as it is practiced today and on some of the possible physiologic mechanisms involved.

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Modern Acupuncture

The modern practice of acupuncture, although superficially resembling the acupuncture practiced in ancient China, is actually quite different. The schema of the meridians is retained because of its utility in learning the acupuncture points. However, ancient explanations for the mechanisms of action have largely been abandoned. A distinction is drawn between those procedures which have a direct bearing on therapeutic results and other practices which are the result of religious and philosophic beliefs. For example, the use of gold or silver needles to achieve the differing therapeutic results of tonification or sedation has been abandoned. Acupuncture is now done with stainless steel needles, since it was recognized that the important factor was pricking of the skin rather than the composition of the needle.

Similarly, the use of pulse diagnosis is no longer a prerequisite for acupuncture treatment. Although it is still used in the Orient and by some Western practitioners, modern acupuncturists with a background of medical training use sophisticated diagnostic techniques before acupuncture treatment is given. This is true in the major medical centers of mainland China where acupuncture is used extensively.

The number and location of acupuncture points used by modern practitioners has changed since ancient times. The "barefoot doctors" of mainland China provide complete care to a large population of rural Chinese, using only about 50 different acupuncture points. Most of these are the very potent points handed down for many generations. Others have been recently discovered, primarily through two different methods. The first is by the clinical observation of therapeutic results while pricking in new locations. The second evolves from the discovery that the electrical conductance at acupuncture points is different from that at other places in the skin. New acupuncture points were found by looking for places of high electrical conductivity using a Wheatstone bridge apparatus capable of measuring small voltage differences.[2]

Although the practice of acupuncture has recently received a great deal of publicity in the United States, largely due to reports by Americans who visited mainland China,[3-6] it has actually been practiced in this country for many years both by physicians and by non-medically trained acupuncturists, and there are isolated reports of its efficacy in the medical literature of the last century.[7,8]

Two therapeutic modes of acupuncture are used in practice today: (1) acupuncture used for the treatment of many diseases and (2) acupuncture employed as an anesthetic procedure (a more accurate term for this would be surgical analgesia).

Almost every conceivable affliction of mankind has been reported at one time or another to be treatable by acupuncture.[1,9-11] Besides its more widely known use in various chronic pain syndromes, such as causalgia, renal and biliary colic, dysmenorrhea, sciatica and glaucoma, some of the specific disorders which are reported to respond well to acupuncture therapy include allergic diseases, such as asthma, hayfever, rhinitis[12] and eczema; muscular skeletal disorders, such as arthritis, gout and neuralgia; gastrointestinal diseases, such as peptic ulcer, diarrhea, constipation and colitis; neurologic disorders, such as paralysis secondary to poliomyelitis[13] and nerve deafness;[14] infectious diseases[15] including epidemic encephalitis and liver abscess; surgical diseases, including acute abdominal conditions and severe hemorrhage[6] and mental illness. Acupuncture therapy is the treatment of choice for acute appendicitis in many Oriental countries.[16]

It is impossible, however, to assess the validity of these accounts, since the type of scientific documentation that forms the basis for Western medical knowledge is almost totally lacking in these completely uncontrolled and often anecdotal reports. Most practitioners agree, however, that once structural changes have taken place, acupuncture is no longer very useful.

With our present degree of knowledge of acupuncture, these reports cannot be totally dismissed. But, to be taken seriously by Western physicians, more careful studies are necessary.

The newest and probably the most dramatic clinical application of acupuncture is as an anesthetic agent. It is this use of acupuncture more than any other which has stimulated the interest of Western observers.[6,17,18] Acupuncture anesthesia was first used in mainland China in 1958 and was immediately recognized to have numerous advantages. Since then its use has been increasing rapidly. It has been used in approximately 50,000 major surgical operations in Peking alone.[19]

Acupuncture anesthesia has been used in almost every type of surgical procedure, including thoracotomy and lobectomy, subtotal gastrectomy, lobotomy for excision of brain tumor, oophorectomy, cesarean section, dental operations

and ophthalmic procedures. In many cases acupuncture alone is used; in others small doses of analgesics, narcotics or sedatives are used in conjunction with the acupuncture. The reported success rate ranges between 75 and 99 percent, varying with the type of surgical procedure rather than any classification of patients. But there is also careful preoperative selection and training of the patients, which is not well detailed in the reports and certainly biases the statistics. Although still successful in a majority of cases, acupuncture anesthesia was found to be less useful in abdominal procedures where satisfactory muscle relaxation is difficult to achieve and traction on the viscera often produces some discomfort.

The details of needle placement and other procedures involved in acupuncture anesthesia are not within the scope of this discussion. Suffice it to say that anywhere from one to a dozen needles are used, their placement dictated by reference to acupuncture charts and clinical experience. Another technique commonly employed is the attachment of an electric generator to the acupuncture needles after they are placed.[20] Stimulation with an alternating current is then applied during the course of the surgical procedure. In other procedures, needles are manipulated manually by the anesthetist.

Besides the obvious avoidance of toxic reactions to the anesthetic agent itself, there are many other advantages to anesthesia of this type. Since a large proportion of surgical morbidity and mortality is due to complications of anesthesia rather than to the procedures themselves, any technique which could decrease these untoward effects would have a significant impact on the outcome of many operations. "Poor risk" surgical patients should be especially benefited. The patients are never unconscious and, therefore, the dangers inherent in supporting cardiac, respiratory and renal function are diminished. The concern about vital system function in the fetus during cesarean section or any other surgical procedure in pregnant women would be similarly lessened.

Postoperative recovery is more rapid since there is no need for recovery from the anesthetic agent. The analgesic effects of acupuncture persist for several hours after operation, and beyond that repeated needling of the same points is frequently employed for the treatment of postoperative pain.

Under acupuncture anesthesia the patient is able to communicate with the operating surgeon. The importance of this should not be underestimated, for in many instances a cooperative patient can significantly decrease the surgical morbidity and increase the chances for surgical success. For example, in operations for ocular muscle weakness, instead of hopefully guessing where paralyzed muscles should be transplanted, the surgeon could more accurately align the eye because the patient is awake and able to cooperate with him in testing his extra-ocular movements. Another example would be thyroid gland operations, in which the danger of damage to the recurrent laryngeal nerve could be lessened by asking the patient to move his vocal cords.

Possible Pathophysiologic Mechanisms Involved in Acupuncture

There are numerous theories concerning the way in which acupuncture produces its effects. Many of these are based on ancient religious and philosophic beliefs and will not be further discussed here. It must be remembered, however, that in the eyes of many practitioners these religious and philosophic explanations are more "logical" and "rational" than the modern scientific theories that Western medical science proposes, for data accepted as "proof" in different cultures are very much related to their fundamental concepts of nature and life.

In general, acupuncture practitioners believe that the acupuncture points are in some way related to the autonomic nervous system, while many Western trained physicians believe that all of the results obtained through acupuncture can be explained by hypnosis, autosuggestion or a placebo effect. Many of the techniques used in hypnosis are also used during acupuncture therapy, but these same techniques also play a role in most other types of therapeutic endeavors.

One of the most important elements for successful hypnosis is the ability of the hypnotist to obtain compliance from the patient.[21] The primary objective is to manipulate the patient's internal and external environment, so he will be more receptive to suggestions. There are many methods used to induce compliance. It may be done entirely verbally; it may employ physical contact and manipulation; and it may even involve the use of gadgets, devices or machines to capture the attention of the subject.

It is easy to see how the aura surrounding acupuncture lends itself to the creation of compliance and suggestibility in the patient.[22] Treatment for many and divers conditions is usually initiated by

the placement of acupuncture needles in the first finger web between the thumb and index finger of each hand. This pricking of the "Ho Ku" point, a very powerful acupuncture point, results in a feeling of soreness, tingling, heaviness or distension throughout the hand and sometimes throughout the entire forearm. This may very well place the patient in the desired state of suggestibility so that further pricking of acupuncture points for the treatment of a specific condition is done after the patient is convinced of the ability of acupuncture to produce widespread effects and thus disposed to a positive therapeutic result.[23,24] In circumstances more familiar to us in this country, similar conditions are established with the taking of vital signs by the nurse when a patient first enters the physician's office; with the use of the stethoscope to auscultate the heart and lungs; or with the prescription of analgesics to treat pain syndromes.

One possible clue to the mechanism of action of acupuncture is found in the research on visceral learning conducted during the past several years.[25-28] It is now evident that autonomic functions such as heart rate maintenance, blood pressure control and core temperature regulation can be rather easily learned by both laboratory animals and man under the appropriate experimental conditions. Yogic practices probably utilize similar autonomic training.[29,30]

It is beyond the scope of this paper to discuss the important implications that this holds for current pathophysiologic interpretations in all aspects of medicine, but it may help to explain how diseases, felt to be purely organic in origin, may be successfully treated by acupuncture. Perhaps the peripheral stimulation of the acupuncture needles acts in some way as a stimulus for retraining visceral responses to function more normally and thus "cure" the underlying disease process. This, of course, is a highly speculative concept and would require a great deal of experimental work for validation.

Acupuncturists refute the role of hypnosis in their therapy by claiming that acupuncture can be used in unwilling and unbelieving patients; that it is effective in unconscious patients (needling comatose accident victims has reportedly instantaneously stopped severe hemorrhage); that it can be used very effectively in the treatment of young children;[31] and that it can be used in animal experiments[32] (after being anesthetized with acupuncture, a mule was eviscerated through an abdominal incision without any evidence of pain perception).

Many Asian countries and the USSR are actively engaged in research on the possible mechanisms through which acupuncture achieves its effects. Although it is very difficult to determine the scientific validity of these experiments, some of the reported findings are of interest.

By using an electrical probe, acupuncture points have been found to have a greater positive charge than the surrounding tissue.[33] Stimulation of one acupuncture point has caused changes in the electrical conduction at distant acupuncture points along the same meridian. If the meridian is transected, these changes in conduction do not occur.

Using myelin stains, a cluster of nerve cells in the pinna of the ear has been located.[6] Stimulation of these cells produces changes in the electrical resistance of the skin over the abdomen. This may explain why the needling of the pinna produces anesthesia sufficient for abdominal operations.

A Korean biologist, Kim Bong Han, discovered small oval cells allegedly not found elsewhere, subepidermally at acupuncture points.[2] He has also located anatomic structures connecting acupuncture points which are histologically different from blood vessels, lymphatics and nerves and do not contain cellular elements. Supposedly, transection of these structures prevented electrical conduction to other acupuncture points and to internal organs. It must be restated that the specific techniques and actual data from which these conclusions are drawn are unavailable in the literature. Many of the results are probably due to technologic errors rather than actual mechanisms responsible for acupuncture's effects (the findings of Kim Bong Han are probably the result of artifacts produced by the fixation and staining of the tissue).

Is there other available experimental work, then, that is scientifically valid and that might shed some further light on the pathophysiologic mechanisms? In 1965 Melzack and Wall proposed a new theory of pain transmission and pain perception.[34] Basically, their *gate control* theory stresses the importance of the spinal cord (specifically the substantia gelatinosa) in modulating both the intensity and frequency with which peripheral nerve impulses are transmitted to the perceptual centers of the brain.

The substantia gelatinosa consists of small densely packed cells that form a functional unit extending the length of the spinal cord; the cells

connect with one another by short fibers and by the longer fibers of Lissauer's tract. The gate control theory proposes that the large nerves ("A" fibers) which enter the spinal cord not only stimulate the firing of the first central transmission cells (T-cells) which cause transmission to the perceptual centers, but also stimulate the cells of the substantia gelatinosa, which in turn act to inhibit firing of the T-cells. The small nerves ("C" fibers), on the other hand, not only stimulate T-cell transmission, but also have the effect of inhibiting the firing of the cells of the substantia gelatinosa and thereby enhance T-cell transmission.[35]

This theory explains very nicely how perception of peripheral stimulation, such as pain, temperature and distension, may be greatly influenced by other peripheral stimulations even at quite distant and apparently unrelated locations. The literature contains many references to the induction of altered perception of peripheral events by the use of different stimuli. Itching can be decidedly reduced by the application of vibration to the itching area.[36,37] It can also be reduced by application of vibrating stimulation to distant areas. Vibration can also increase the threshold for the perception of an electric shock. This effect lasts a long time after the vibration has ceased.[38]

The relief of phantom limb pain that some amputees obtain by gently tapping the stump with a rubber mallet, whereas heavier pressure increases the intensity of the pain,[39] may also be explained by postulating that differential stimulation of the "A" and "C" fibers occurs. The implantation of electrical stimulators directly in the spinal cord to relieve severe symptoms in certain patients with chronic pain syndromes is a direct application of this theory.[40]

Application of the gate control theory and other experimental work to acupuncture therapy would lead one to conclude that needling is probably not necessary to achieve the results. Stimulation of other sensations in the periphery should be capable of producing beneficial effects. The effect of moxibustion, the combustion of an herb directly on the skin or wrapped around an acupuncture needle, could then be explained by the stimulation of pain and temperature perception. Japanese finger pressure therapy (shiatsu) utilizes firm pressure over certain areas to treat many diseases.[41] This, too, could be explained by the gate control theory.

Perception of visceral sensations may also be modulated by the gate control mechanism in the substantia gelatinosa. Cardiac pain has been reported to be abolished by the injection of a local anesthetic in trigger areas on the chest wall.[42] By applying thermal, mechanical and chemical stimulation to the skin of the abdomen and back, circulatory changes in the small vessels of the intestines can be induced.[43-45] Reports in the acupuncture literature, although difficult to validate, seem to relate very similar findings. Intraluminal pressure recordings of the stomach have shown that when the point of tonification of the stomach meridian is stimulated, peristaltic contractions increase. Conversely, by electrically stimulating the gastric mucosa, changes in conduction at acupuncture points along the stomach meridian were found.[2,46]

With the use of an electrical probe in the cerebral cortex of cats, recordings could be obtained when painful stimuli were applied in the periphery. By needling the appropriate acupuncture points the voltage change in the cortex was reduced.[6] In the medical literature there is a report of a patient with an old parietal lobe lesion who perceived circumscribed pain and temperature sensations in the absence of apparent external stimulation.[47] These sensations could be inhibited by superficial pressure, vibration or touch applied to other anatomic areas.

The actual mechanism of action of acupuncture is probably a combination of both psychologic and physiologic events. This, of course, would be very similar to the way in which other therapeutic modalities act. It is only the relative importance of the two mechanisms that remains to be clarified.

Precautions

A brief mention of the potential problems resulting from acupuncture therapy should be made because, as with any other therapeutic procedure, complications can occur.

Probably the most important of all problems involving acupuncture is its use in place of Western medical therapy. Physicians and acupuncture practitioners should be circumspect and conservative in their appraisal of what acupuncture can accomplish. Western medicine has developed many diagnostic and therapeutic techniques which have proved efficacious after many years of study and experience. Where it is employed, acupuncture should be used as an adjunctive form of therapy to standard medical treatment, not as a replacement for conventional cures.

There is the possibility that patients would seek standard medical treatment only after acupuncture

had failed to produce results. The literature contains very little information about this hazard, although the military medical literature from Vietnam contains reports of such cases among the Vietnamese population.[48] Often complications arise which could have been averted if early diagnosis and prompt treatment with Western techniques had been instituted.

Some of the hazards, such as hepatitis and local infection from improperly sterilized needles, are quite obvious. Only their frequency and severity remain to be documented. The incidence of these complications can be drastically reduced if modern techniques of sterilization and antisepsis are employed. Bleeding from the puncture of large blood vessels may also occur, but the needles are so small that this does not present a major hazard.

Occasionally a needle may break off in the patient and remain as a foreign body. Eventually most of these will work their way to the surface and be extruded. However, it is possible for these fragments to reach deeper locations and to penetrate other organs. Since some acupuncture points are in close proximity to joint spaces, some are within the joints themselves and some are in close proximity to large nerves, the effects of repeated needling and the possible foreign body reaction in these areas must be closely examined.

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